4.4 COMMERCIAL AND SPORT FISHERIES

This section addresses existing conditions and impacts to commercial and sport fisheries[1], kelp harvesting and aquaculture activities, all of which depend on a healthy environment and responsible human activities to survive and flourish. The analyses focus on both routine operations and accident conditions for the continuation of Long Wharf operations under the proposed new lease. A regulatory setting section is included, as are the impacts to alternatives and impacts to the cumulative environment.

4.4.1 Environmental Setting

Methodology and Data Collection

The primary study area encompasses that portion of San Francisco Bay from the Oakland-San Francisco Bay Bridge north, including San Pablo Bay to the Carquinez Bridge, and west to the Golden Gate. Secondary areas include the Carquinez Strait and from the Bay Bridge south, including all of South San Francisco Bay. The remainder of the study area includes the outer coast of California. Several databases and maps have been used to describe the fisheries, aquaculture operations, and kelp harvesting activities in these areas.

For fisheries in the Bay, the California Department of Fish and Game (CDFG) catch and landing statistics, Department of Health Services (CDHS) fish consumption data, anecdotal information from interviews with knowledgeable individuals, and written materials were used to describe commercial and recreational fisheries. No kelp harvesting or commercial aquaculture operations occur in the Bay.

For resources along the outer coast, CDFG port landing data was used to describe commercial fisheries. Sport fisheries information sources include recreational fishing statistics from the Pacific States Marine Fisheries Commission Recreational Fisheries Information Network (RecFIN) database and other written documentation. Kelp harvesting and aquaculture activities are recorded by CDFG and pertinent information was included in this analysis. A short description of the CDFG fisheries databases is provided to explain their uses and limitations.

To standardize fish landing reporting, CDFG divides coastal and Bay waters into reporting blocks (refer to Figure 4.4-1 that appears later in this section). CDFG provides both commercial and charter boat fish landings by fishing area or block (where the fish are caught) and by port or region (where the fish are landed). Fish dealers, processors, or charter boat operators record landings data. For commercial fisheries, data concerning species, weight, catch block, gear type, and price paid to fishing operators are provided to CDFG. Charter boat operators report to CDFG the number of fish caught on their boats.

[1] Fisheries are defined, by broad definition of the Federal Fishery Conservation and Management Act (FCMA), as fish, their habitat, and fishing activities.

The collected fish landings data have their limitations. For commercial fisheries, the data may not be entirely accurate or complete for several reasons. Fishing operators may report catches in blocks other than where the fish were actually caught. In addition, catches often occur in more than one block, but may be reported for only one block. Because of these limitations, the CDFG data are supplemented by other information to better describe the fisheries.

For sport data, the charter boat landings provide the only consistent database that records angler catches, despite the fact that catches from recreational private boats, shore/beaches, and piers make up about 86 percent of total recreational catches (U.S. Department of Commerce 1997). Information from seafood consumption studies is used to further describe the fisheries but these data are based on short-term sampling studies that describe a snapshot in time, rather than a long-term history of fishing activity. These databases were used despite these limitations; qualitative updates are provided from other sources, as needed.

San Francisco Bay Estuary Fisheries: Golden Gate to Suisun and South Bays

Historical Overview

San Francisco Bay is California's largest estuary and is divided into three connecting bays: San Francisco Bay proper, San Pablo Bay, and Suisun Bay. These bays receive large volumes of freshwater runoff from the Sacramento and San Joaquin River systems. These systems begin in the Sierra Nevada and drain California's Central Valley. In general, most of the San Francisco Bay is very shallow, with an average depth of about 20 feet. There is also an extensive system of mudflats in San Pablo Bay and South San Francisco Bay (Squire and Smith 1977).

One of the environmental influences on San Francisco Bay fish is movement of the null zone, which marks the upstream edge of seawater influence. The location of this zone moves upstream and downstream depending on changes in freshwater flows from the Bay's tributaries. On the downstream side of the zone, saltwater fish predominate; freshwater fish are found on the upstream side. Therefore, fishing areas for some species generally cover broad areas of the Bay, but shift within the areas depending on the zone's location. Changes in tides, water conditions, seasons, and human activities also influence the Bay's fisheries.

Historical Summary

Historically, major native fisheries in the area included shrimp, sturgeon, and Chinook salmon, among others. Striped bass, an introduced species, is also very popular among anglers in the estuary.

The estuary's fisheries have always been important to humans as evidenced by the tens of thousands of people who lived along its shores before Europeans arrived. By the 1800s, fish were a major resource for settlers, with the primary species being

Chinook salmon, sturgeon, striped bass, and Pacific herring. The Bay-Delta region was the largest fishing center on the west coast. However, human use of the Sacramento River system and the Bay took a heavy toll. Adverse impacts on the Bay and fisheries began with siltation caused by hydraulic mining in the mid-1800s. As California's population grew, extensive land reclamation, dredging and filling, urban development, water pollution, dams, upstream water diversions, and other water developments altered the Bay to such an extent that Bay fisheries declined significantly. Historically, over fishing also took a toll on fisheries. However, in recent years, other activities have caused major declines.

Another factor that drastically changed the Bay's food web was the introduction of non-native plant and animal species, beginning in the nineteenth century. American shad, striped bass, carp, and catfish were deliberately introduced. Introduction of non-native species accelerated in the twentieth century with the continued deliberate introduction of fish and the unintended introduction of harmful invertebrates and fish, mainly through ship ballast water (CALFED Bay-Delta Program 1999). The Asian clam was first detected in 1986 and within a few years was seen in concentrations of up to 1,500 per square meter in Suisun Bay. It is now the most abundant invertebrate species in Suisun and San Pablo Bays consuming food and dominating habitat that would otherwise serve native species (California State Coastal Conservancy 1995).

Pacific Herring

Native Americans harvested pacific herring in San Francisco Bay. After European settlement the catch declined until 1918, when the harvest peaked at 8 million pounds. This peak ended a year later when reduction of whole fish to fishmeal was prohibited. From 1947 to 1954 herring were canned and landings peaked again in 1952 at 9.5 million pounds. People preferred sardines over herring, so demand plummeted and the fishery went dormant in 1954. In 1973, following the crash of Japanese herring fish stocks, the Japanese government liberalized import quotas, which led to reopening of the fishery in San Francisco Bay and elsewhere on the west coast (CDFG 2001). This modern fishery focuses primarily on harvesting the roe right after the fish spawn, although few whole herring are marketed for human consumption, aquarium food and bait.

Herring have had no preferences to specific locations of the Bay. Historically, primary spawning areas have been the shoreline along Sausalito, Richardson Bay, Fort Baker, Yellow Bluff, Tiburon, Paradise City, and Angel Cove. The modern sac-roe fleet began fishing these areas by using round-haul (purse seines) and gill nets. After harvest, the herring ovaries (skeins) are brined, exported for sale, and prepared for a traditional Japanese New Year's delicacy called "kazumoko". San Francisco Bay herring are highly valued for their unique golden coloration.

Shrimp

The shrimp fishery began in the early 1860s; by 1871 Chinese immigrants fished using stationary shrimp nets and were exporting large quantities of dried shrimp meal to China. Annual landings peaked in 1890 at over 5 million pounds. By 1915, shrimp were fished by beam trawl and in 1935 landings totaled 3.4 million pounds. Landings steadily declined due to reduced demand for fresh and dried shrimp for food. By the early 1960s, average annual landings declined to 1,500 pounds. In 1965, this fishery bounced back to supply live bait for sturgeon and striped bass sport fishing (CDFG 2001).

Sturgeon

Sturgeon have been very important to Californians; sturgeon remains have been found in Native American middens in the Bay/Delta region. White sturgeon has dominated the fishery; although there have been small catches of green sturgeon. The commercial fishery lasted from the early 1860s to 1901 and concentrated in the Bay and Delta. Fishing gear included gillnets, longlines and multiple unbaited hooks. Landings peaked at 1.65 million pounds in 1887, declined to 0.3 million pounds in 1895 and to 0.2 million pounds in 1901, when the fishery was closed. Sport fishing for sturgeon was later legalized in 1954. In 1964, the small catch increased significantly when the minimum size limit decreased from 50 inches to 40 inches and it was discovered Bay shrimp were effective bait. By the 1980s the harvest rate was 40 percent greater than the rate during the two earlier decades. In 1992 a minimum size limit of 46 inches and a maximum 72-inch size limit were established to protect the species from over harvest. (CDFG 2001). Permitted fishing gear is limited to hook and line.

Chinook salmon

The only major salmon species to enter the Golden Gate is Chinook salmon. As with sturgeon, salmon fisheries existed long before European settlers arrived in the 1700s. Harvests of Sacramento/San Joaquin watershed Chinook salmon by American Indians may have exceeded 8.5 million pounds annually. Traditional fishing methods included use of gill and dip nets, fishing spear and communal fish dams. The commercial fishery began with the advent of the gold rush. By 1860 the gillnet fishery was well established in Suisun Bay, San Pablo Bay and the lower reaches of the two rivers. The canning industry stimulated the growth of the fishery, with canneries operating throughout the river system. In 1882 the fishery reached its peak when 12 million pounds were landed. Shortly thereafter, the fishery collapsed due primarily to pollution and degradation of rivers by mining, agriculture, and timber operations, combined with increased landings. By 1919 the last cannery closed, and in 1957 the last inland commercial fishing area open to the general pubic was permanently closed (CDFG 2001).

The ocean troll fishery continued and today's trollers use fishing techniques developed during the 1940s. In addition, electronic equipment has significantly increased the efficiency of the modern troller. In the 1960s and 1970s the fishing industry enjoyed relatively high and consistent harvests, averaging about 7 million pounds annually of Chinook. Later commercial harvests have been much more erratic, with the largest catch being 14.4 million pounds in 1988 and the lowest harvest being 1.6 million pounds in 1992, an El Niño year (CDFG 2001).

The ocean sport fishery became popular with the development of the commercial passenger fishing vessel (CPFV) after World War II. The highest sport landings occurred in 1995 when anglers landed a record 397,200 Chinook. The lowest landings during the last 30 years were recorded in 1983 (CDFG 2001).

Oceanic and in-river conditions play major roles in salmon catches; however, the variability can also be attributed to changes in fishery regulations. Since 1988, progressively more restrictive regulations have been imposed on the commercial fishery to protect stocks of special concern, including those that are Federal and State endangered or threatened species. As an example, the sport fishery is the only allowable salmon fishery in the estuary.

Striped bass

A major sport fishery has evolved around the striped bass. Striped bass were introduced in 1879 by railcar from the east coast; 132 were unloaded in Martinez and released in the Carquinez Strait. Three years later 300 more bass were shipped in and released; the entire west coast striped bass fishery evolved from these introductions. In the 1970s legal sized bass (over 18 inches) numbered around 2 million. By 1995, because of pollution and freshwater diversions the population of legal bass hovers around 800,000 (California State Coastal Conservancy 1995).

Current San Francisco and San Pablo Bay Fisheries

Details on recorded fish catches in the South, Central, and North Bays for those species representing about 95 percent or more of the catch from 1991 to 2000 are provided in Appendix C (Tables 1a and 1b). Figure 4.4-1 shows the primary commercial fishing areas and Figures 4.4-2 and 4.4-3 depict sport fishing areas.

Figure 4.4-1 – San Francisco Bay Primary Commercial Fisheries

Figure 4.4-2– Recreational Fisheries

1 Figure 4.4-3 San Francisco Bay Recreational Fishing Areas
2

Commercial Fisheries

Pacific Herring

Pacific herring spawning locations change from year to year and seem to favor areas that are less saline. During the 2005[2] season herring spawned along the shoreline from Point San Pablo to San Francisco Bay Bridge, at Robert Crown Memorial State Beach in Alameda, San Francisco, South San Francisco, Burlingame, Richardson Bay, Fort Baker, Sausalito, Belvedere Cove, Point San Quentin, and on Elephant Rock (State of California 2005a). The fish target hard surfaces (such as docks, piers, pilings) and Bay vegetation, such as eelgrass. The San Francisco Bay Pacific herring harvest occurs during spawning season, generally from December through March, until quotas are filled. The focus of the herring harvest is the roe, which is exported to Japan. Fishing is conducted mainly with gillnets (CDFG regulations phased out use of round haul nets); a few fishing interests use the roe-on-kelp method. Kelp is harvested from southern California and hung from barges in the Bay; herring spawn on the kelp, which is then landed and processed.

Over the last 10 years, most herring fishing has occurred in CDFG block 488 (an area encompassing the Long Wharf), according to CDFG. However, herring spawn and a portion of the fishery occurs in the South Bay, especially during years with higher than normal rainfall.

As stated above, herring fisheries are highly managed by CDFG through the use of area closures, timing and gear restrictions, and quotas. Regulations change annually based on the previous year's estimates of spawning biomass. Currently, CDFG allows harvest of about 10 percent of the previous year's spawning biomass. (State of California 2005a).

The San Francisco Bay Pacific herring fishery experiences annual ups and downs (ranging from nearly 23 million pounds landed in the 1997 season to 290,000 pounds in the 2005 season), although on average, it is the largest commercial fishery within the Bays. The herring fishery has been important in terms of San Francisco area port landings (43 percent of total landings in 2000) and is important from a statewide perspective as well. In 2000, herring landings (6.4 million pounds) were the tenth highest in California, representing over 1 percent of all landings in California and nearly all were caught in San Francisco Bay.

Since the 1997-98 El Niño herring spawning populations have declined well below long-term averages. As a result, the fishery has landed far fewer fish than allowed by CDFG since the 2002 season. The populations may be on the rebound since the current spawning biomass estimate shows a 71 percent increase over 2004 estimates. The latest estimate exceeds the long-term average, following seven consecutive seasons of

2 The San Francisco Bay herring fishing seasons span two calendar years. For purposes of this report, the seasons are represented by the latter year. For example, year 2005 represents the harvest season of 2004 – 2005.

below-average spawning numbers (State of California 2005a). In the 2005 season, a total of 417 permits for San Francisco Bay (down from 440 during the 2002 season) were issued by CDFG (Moore 2005).

Shrimp

San Francisco Bay and brine shrimp fishing occurs year round. In 1965, this fishery was developed to supply Bay shrimp as live bait for sturgeon and striped bass sport fishing. A small percentage of catch is still consumed fresh. The commercial harvest has been entirely by beam trawl; live tanks are used on all vessels and shrimp are transported to local bait shops by truck in either the tanks or iced-down wooden trays. Staghorn sculpin, yellowfin goby, and long jaw mudsucker are also caught and sold by shrimpers.

Key fishing locations include South Bay, northwestern San Pablo Bay and Carquinez Strait (Figure 4.4-1). Fishing also occurs in waters less than 20 feet deep in the channels of the Estuary's shallow reaches.

Currently, the number of vessels harvesting shrimp ranges from to 8 to 10. Three trawlers fish in the South Bay, 6 in the North and San Pablo Bays and 1 roams throughout the Estuary (Hieb 2005). From 1991 - 2003, recorded landings for San Francisco Bay Area ports totaled 14.9 million pounds and averaged 1.1 million pounds per year. From 2000 to 2003, landings were less than the longer term average and ranged from more than 972 thousand pounds to more than 607 thousand pounds. (CDFG 1991-2004).

Other Fisheries

Small commercial fisheries also exist for finfish and shellfish, including white croaker, halibut, rockfish, salmon, shark, and Dungeness crab. The Bay is also a nursery area for Dungeness crab, an important ocean commercial and sport fishery north and south of San Francisco Bay. The Bay Institute reports good news for the fishery: the number of young Dungeness crabs in the estuary is on the rise. The recent increase in abundance may be related to improved ocean conditions, as well as efforts to reduce pollution and restore tidal marsh habitat in the Bays (The Bay Institute 2005).

Sport Fisheries

The Bays support a wide variety of fishes for sport fishing opportunities including charter fishing, private boat fishing, pier fishing, and beach/shore fishing. As shown on Figure 4.4-3, over 100 boat launches, marinas, and piers are used by anglers. The most popular game fishes caught in the Bays are striped bass, Chinook salmon and sturgeon. While most salmon fishing occurs in the ocean outside the Golden Gate, striped bass is caught through-out the estuary and sturgeon fishing concentrates in San Pablo Bay, portions of South Bay and points east. Surfperch, halibut, Bay shrimp, smelt, rockfishes, sharks, rays, clams, and others also offer great fishing opportunities to Bay Area anglers (California State Coastal Conservancy 1995).

Between 1989 and 2003, the number of charter boats operating out of San Francisco Bay ranged from a high of 93 to a low of 44, averaging 59 over the 15 years. In 2003, charter boats operating in San Francisco Bay and the Delta numbered 44, total number of anglers was 52,747 and they caught a total of 150,031 fish (CDFG 1989-2004).

Bay area boat anglers represent several ethnic backgrounds. In 2001 the CDHS and San Francisco Estuary Institute (SFEI) conducted a seafood consumption study and surveyed anglers throughout the Bay estuary. The results of the survey are explained in Chambers Group, Inc. (2004) and summarized here. Caucasians made up 39 percent of those interviewed (1,331), while Asians made up 33 percent, Latinos/ Hispanics made up 13 percent and African Americans totaled 9 percent. By far, most were English speaking (88 percent), followed by Spanish (4 percent), Vietnamese (3 percent) and Cantonese (1 percent) (SFEI 2001). Throughout the estuary, striped bass was targeted and consumed by 55 percent of anglers, while 23 percent focused on halibut, 18 percent preferred jack smelt, sturgeon and white croaker and about 4 percent consumed salmon caught in the estuary (CDHS 2001).

Striped Bass and Other Pelagic Fish Declines

Unfortunately, the estuary is experiencing a precipitous decline in striped bass, longfin smelt and other fish species. Ongoing scientific monitoring of the estuary show that these species are at a 45 year low, despite Bay and Delta ecosystem restoration efforts. Currently, scientists are studying the situation and have narrowed down the possible causes to three: recently introduced, invasive species, pollutants in point-source discharges (from identifiable pipes/drains) and urban/agricultural run-off, and freshwater exports from the Delta.

The Bay-Delta has become a haven for introduced species. While the adverse effects of the Asian clam have been widely reported (Chambers Group, Inc. 2004), scientists have also called out the cyclopoid copepod (*Limnoithona teraspina*), (which may be a poor food source for fish and a predator of a good food source), as increasing in abundance to such an extent that it is the most profuse copepod in the estuary (Armor, et al. 2005). New and ongoing studies are being carried out to better define the degree to which pollutants, invasive species and fresh water exports may be responsible individually, in sequence or in concert for the apparent long-term declines in fish populations. Studies will then be followed by actions to address the problems (State of California 2005).

Fisheries Near the Long Wharf

Pacific Herring -- Commercial

The Long Wharf is located in CDFG commercial fish block 488. This block roughly encompasses the area between the Oakland-San Francisco Bay Bridge and a line drawn between Point San Pablo and Point San Pedro. The area supports Dungeness crab habitat and eelgrass beds, some which exist near the Wharf.

The area near the Long Wharf has historically been herring spawning habitat and is nearly surrounded by shallow water fish habitat. Herring spawning areas are located in the immediate vicinity of the Long Wharf and the fished spawned in these areas during the 2005 season. (State of California 2005a).

Pacific herring made up nearly 80 percent of the reported landings in block 488 for 1991 to 2000 (Appendix C, Table 1a). Northern anchovy, halibut, white croaker, rockfish, yellowfin goby, salmon, Dungeness crab, and numerous other species were caught in the block as well. Trawl, hook and line, and trap gears were used to harvest these other species. No known shrimp fishing occurs in the vicinity of the Long Wharf. Additional information on fishes in the vicinity is presented in Section 4.3, Biological Resources.

Sport Fisheries -- Charter/Private Boats

The Long Wharf is located near two marinas: Richmond Marina and Brickyard Cove Marina, 2.75 miles and 1.6 miles, respectively, southwest of the Long Wharf. These marinas account for about 3 percent of the total number of Bay marinas. Charter boat fishing for sturgeon, striped bass, halibut, shark, smelt, and perch occurs directly off the Long Wharf (personal communication, O'Connell 1999). Private boat anglers are expected to follow similar fishing patterns.

Recorded charter boat catches in CDFG block 488 for 1991 through 2000 (Appendix C, Table 1b) show that halibut, bass, rockfish, salmon, and shark dominate the catches. The data show that charter boat activity in the Bay is heaviest in this block. Based on cumulative total catches for 1991 through 2000 from the CDFG Commercial Passenger Vessel database, catches in block 488 equal about 82 percent of catches in San Francisco Bay.

The ethnic background of East Bay boat anglers is diverse. Table 4.4-1 summarizes the seafood consumption study demographic survey data for private boat anglers (survey conducted at Richmond Marina) and charter boat passengers (survey conducted at San Pablo Yacht Harbor) in the vicinity of the Long Wharf. Surveyed private boaters were 49 percent Caucasian (62 surveyed), 27 percent Asian (34), 13 percent African American (16), and 5 percent Latino/Hispanic (6), out of a total of 126 surveyed anglers. 4 percent were non-English speaking (Vietnamese).

Surveyed charter boat passengers totaled 13 people and were 84 percent Caucasian (11), 8 percent Asian (1), 8 percent African American, and 0 percent Latino/Hispanic (0). All surveyed passengers spoke English.

Table 4.4-1
Ethnic Backgrounds of Surveyed Anglers

Sites	African/ American		Latino/ Hispanic		Caucasian		Asian		Other/ Unknown		Total	
	N *	%*	N	%	N	%	N	%	N	%	N	%
Richmond Marina	16	13	6	5	62	49	34	27	8	7	126	100
San Pablo Yacht Harbor	1	8	0	0	11	84	1	8	0	0	13	100
Point Pinole Shoreline Park	5	11	6	13	5	11	29	63	1	2	46	100
Total	22	12	12	6.5	78	42	64	35	9	5	185	100

***N = Numbers of interviews; % = row %.**
Source: SFEI, 2001.

Pier and Shore/Beach Fishing

Public piers, shoreline, and beach areas that provide access for fishing are located throughout the Bay Area; however, access in the immediate area of the Long Wharf is limited. Fishing occurs along the riprap shore of Richmond Marina and anglers haul in starry flounder, cabezon, leopard shark, and other fish in the Keller Beach area, approximately 0.8 mile southwest of the Long Wharf (California State Coastal Conservancy 1995).

The seafood consumption study survey data shows that at Point Pinole Shoreline Park, 46 pier, beach and bank anglers were surveyed: sixty-three percent were Asian (29), 13 percent were Latino/Hispanic (6), and 11 percent were Caucasian (5) and African American (5), respectively. Twenty-two percent of anglers (10) were non-English speaking (Spanish, Vietnamese, Cantonese).

Future Trends

Commercial Fisheries

Pacific Herring

Herring populations and the size of the fishery are dependant on oceanic and Bay conditions so population sizes will continue to fluctuate from year to year. CDFG attributes these fluctuations to periodic warming of Pacific Ocean waters and has documented that declines in San Francisco Bay occur during or right after El Niño events. Because the fishery is so closely monitored and the current management strategy has proven to be effective, the long term outlook for the fishery is good, barring catastrophic events in the Bay that destroy or contaminate spawning areas. Harvest levels will fluctuate, in response to natural conditions and CDFG conservative harvest quotas, annual population assessments, regulations limiting the number of commercial operators and close coordination with the herring industry (CDFG 2001).

Shrimp

Expectations for the shrimp fishery remain as they are now; most of the product is used for angler bait, and little is reserved for human consumption. The market is not expected to change much over the next 20 years. Shrimp populations appear to vary widely from year to year. Studies show that abundance of California bay shrimp increases with increased river inflow to the estuary, probably because juvenile shrimp favor low-salinity habitat. Harvest management is limited to compiling logbook data and monitoring species composition in Bay shrimp landings. Catch limits, closed seasons or restricting harvest in areas are not considered necessary by fisheries regulators because the limited demand maintains fishing effort at levels which would not threaten long-term sustainability of the species. If freshwater inflows increase due to upstream fishery restoration efforts, there may be a beneficial effect on the shrimp fishery (CDFG 2001).

Sport Fisheries

Demand for recreational fishing, in general, may increase as the Bay Area population increases. However, recreational fisheries are on a general decline. As with commercial fisheries, recreational fishing growth is limited more by the supply of healthy fish than by demand. Therefore, if the Bay's condition significantly improves, recreational fishing will likely grow. The reverse situation is also possible.

Sturgeon

Sturgeon annual harvest estimates show that angling regulation changes begun in 1990 are reducing harvest rates by about 50 percent of the levels seen in the 1980s. Despite the decreased fishing effort, sturgeon populations vary greatly over the years. The highest estimate of 142,000 fish was in 1997. Annual fish populations vary due to changes in high spring fresh-water outflows from the Delta and scientists attribute the high population levels to the very wet 1982-1983 period. Conversely, experts note the severe 1987-1992 drought adversely affected reproductive success and caused a substantial decline in the adult sturgeon population, as recruitment nearly ceased and reduced growth rates and mortality limited the abundance of fish in the harvestable population. Subsequent wet water years have triggered another cycle of increased populations as fish from 1993 and later years mature (growth to adult maturity takes about nine to sixteen years) and enter the fishery. Charter boat catch statistics for block 308 mimic these trends. In 1998 – 2000 only 85 sturgeon were caught, compared to 561 caught during 2002 – 2004. Experts expect that no future angling restrictions are needed, due to low harvest rates, past rapid recoveries from population lows and current protection of the most fecund females by the 72-inch maximum size limit (CDFG 2001).

Salmon

The recreational salmon fishery is expected to remain unstable due to watershed and Bay-Delta degradation, fluctuations between drought and wet years, and listing of species as either Endangered or Threatened pursuant to Federal and/or State Endangered Species Acts. Three emerging trends may prove hopeful for the fishery. Ocean fishery management quotas are growing stricter as fish populations become more threatened. Restoration in the Sacramento and San Joaquin watersheds, including the Delta and the Bay, is increasing as more financial resources are devoted to improving habitat. Restoration efforts may be paying off because salmon populations are on the rise. Lastly, negotiations over increasing water flows from upstream water developments and diversions in the rivers and Delta are ongoing. If these efforts are successful, beneficial effects may be seen in 10 to 20 years.

Striped bass

As with salmon, the future of the striped bass fishery is uncertain. The fishery's future depends on present efforts to successfully screen water diversions, to succeed at hatchery programs and to deal with population declines that may be caused by invasive species, pollutants and Bay-Delta water exports.

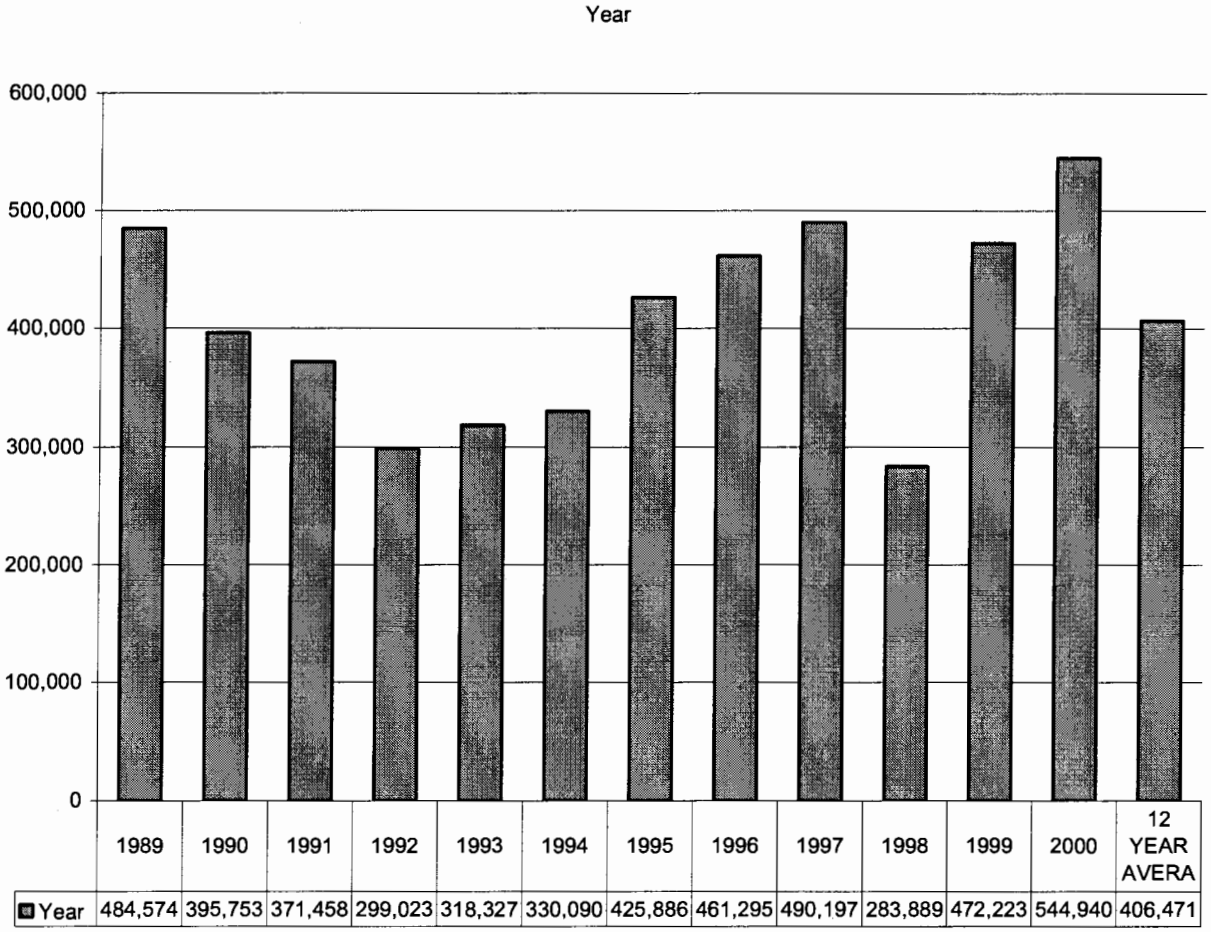
Outer Coast: Oregon Border to Mexico

Commercial Fisheries

Statewide commercial fish landings are reported for all ports in California, including those in the Eureka, San Francisco, Monterey, Santa Barbara, Los Angeles, and San Diego areas. Collectively, these ports reported a total of 4.9 billion pounds of fish from 1989 through 2000 (CDFG 1989-2001).

Statewide landings ranged from a low of 284 million pounds in 1998 to a high of 545 million in 2000 (Figure 4.4-4). The predominant species over the 10-year period were mackerel (caught by trawl and purse seine), squid (purse seine), urchin (dive), and Dover sole (trawl). Other productive fisheries included tuna species (hook and line and purse seine), Pacific herring (gill net), Pacific hake or whiting (trawl), Pacific sardine (purse seine), and Dungeness crab (trap). Less dominant fisheries included rockfish (hook and line, trawl and trap), shrimp (trawl), thornyhead (trawl), anchovy (purse seine), and salmon (hook and line).

Figure 4.4-4 – Annual California Commercial Fish Landings 1989-2000



Source: CDFG 1989-2001, Table 15

Marine Aquaculture

There are 41 registered marine aquaculture facilities along the California coast. These facilities are raising mainly abalone, oysters, clams, scallops, seaweed, and mussels. Research and development on raising halibut, corvina, shellfish, and other species is being conducted (State of California 1999). Many of these facilities do not lease offshore areas; however, they all depend on high-quality ocean water for their operations.

Marine aquaculture leases totaled 11 in 1998. These leases were clustered in Tomales and Drakes Estero in Marin County (6), Morro Bay (1), and off Santa Barbara County (4) (State of California 1999). More information on the aquaculture industry can be found in Chambers Group, Inc. (1994).

Kelp Harvesting

As of 2001, seven kelp bed lessees leased 24 kelp beds totaling 32.56 square miles from Ano Nuevo (San Mateo County) to San Diego (CDFG 2001a). If a bed is leased, the operator has an exclusive right to harvest from the leased portion. Any licensed harvester, consistent with CDFG regulations, may harvest unleased beds.

Kelp grows in dense beds in waters up to 100 feet (30 m) deep, but most plants concentrate in depths of 60 feet (18.25 m or less). A kelp bed may be harvested several times a year for a variety of products derived from alginates, which are extracted from the kelp. The extract is currently used in inks, dyes, latex, rubber, and food stabilizers. Kelp is also harvested by San Francisco Bay herring fishing operators for the herring roe on the kelp. More information on kelp bed harvesting can be found in Chambers Group, Inc. (1994).

Sport Fisheries

Recreational finfish catches for the outer coast are estimated by the Pacific States Marine Fisheries Commission. These estimates are based on surveys that are conducted as funding is available; as such, they have not been conducted each year. Although the RecFIN database is incomplete, it is the only statistical database available that provides an overview of marine recreational fishing activities for California. The data are summarized in Table 4.4-2.

Table 4.4-2
California Recreational Fish Catches, 1989 - 2001
(Thousands of Fish Caught)*

Fishing Mode	Northern California	Southern California
Artificial (Piers, docks, etc)	10,783	20,021
Beach/Bank	15,559	7,414
Shore Modes	3,113	5,452
Party/Charter Boat	10,553	49,351
Private/Rental Boat	32,882	81,479
Modes Total	72,891	163,717
Source: Pacific States Marine Fisheries Commission 2002. *** Includes fish caught and released**		

In northern California, a total of 72.9 million finfish were reported by surveyed anglers from shore, party boats, and private boats from 1989 to 2001. The most popular species were surfperch, rockfish, smelt, sanddab, and white croaker. The vast majority of recorded catches (88 percent) were made within 3 miles of shore.

For the same years in southern California, 163.7 million finfish were reported caught by surveyed anglers. The majority of the catch was bass, perch, scorpionfish, mackerel, whitefish, shark, barracuda, white croaker, and yellowtail. The smaller percentage of recorded catches (79 percent) within 3 miles of shore, reflects the influence of southern California weather and the ensuing greater popularity of fishing farther offshore.

4.4.2 Regulatory Setting

There are two general aspects of fisheries related governmental regulations: resource harvesting management and controls on human development. Information on the regulatory framework aids in understanding the interrelationships between the two types of regulations that affect resource harvesting.

Development can have a deleterious effect on the harvested resource or harvesting activities. If resources are adversely affected to the extent that productive habitat or populations are reduced, harvesting managers will likely respond by limiting harvests. A key example is the salmon fishery and fish declines resulting from timber harvest and inland water development.

Fisheries, aquaculture, and kelp harvesting are overseen by several State and Federal agencies. In 1998, much of the California Legislature's authority over fisheries management was transferred to the CDFG and the Fish and Game Commission as a result of enactment of the Marine Life Management Act. CDFG licenses recreational and commercial fishing operators, aquaculturists, and kelp harvesters; enforces regulations imposed by the Commission; and reviews development project environmental reports to ensure protection of resources and access to harvesting areas. CDFG also administers the California Oil Spill Prevention and Response Act. Sections of the Act of direct relevance to this resource require compensation for lost access or damage to harvested resources and authorize the training and use of mariners for oil spill response.

Salmon, groundfish, and pelagic species are managed by the Federal Secretary of Commerce, who relies on guidance from the Pacific Fisheries Management Council (PFMC), a regional entity with representatives from the fishing industry, the public, and State and Federal agencies. These organizations, through development of fisheries management plans authorized by the Federal Fishery Conservation and Management Act (FCMA), the Sustainable Fisheries Act, and the American Fisheries Act, impose seasonal, geographic, and gear limitations to help protect species from over-harvesting. For some fisheries, harvest quotas or bag limits are used. Management also takes into account harvested species that are protected by State and Federal Endangered Species Acts. The National Marine Fisheries Service (NMFS) and CDFG enforce regulations imposed by the Department of Commerce.

Coastal zone development is regulated by the San Francisco Bay Conservation and Development Commission (BCDC) and the California Coastal Commission (CCC). BCDC develops and implements plans for the conservation and development of San Francisco Bay waters and regulates shoreline development, including commercial and

recreational fishing facilities. The CCC, which has authority along the coast (excluding San Francisco Bay), helps ensure that the biological productivity of coastal resources is maintained, enhanced, and restored for commercial, recreational, scientific, and educational purposes, and ensures that onshore commercial and recreational fishing facilities are protected and, where feasible, upgraded.

The California State Lands Commission (CSLC) manages and protects important natural resources and uses on public lands, including tidelands. Commercial and recreational fishing, kelp harvesting, and aquaculture are all considered important uses by the CSLC. Permits are issued for development on tidelands, and mitigation is often required to help protect natural resources and access to those resources.

Other agencies with authority to regulate development and ensure protection of aquatic resources include the EPA, the Corps, the USFWS, and State and regional water quality control boards.

4.4.3 Impact Significance Criteria

An impact would be considered adverse and significant if:

- Project activities temporarily reduce any fishery in the Bay, Straits or along the outer coast by 10 percent or more during a season, or reduce any fishery by 5 percent or more for more than one season;

- Project activities affect kelp and aquaculture harvest areas by 5 percent or more, or

- Lost harvesting opportunities due to harbor closures, impacts on living marine resources and habitat, and equipment or vessel loss, damage, or subsequent replacement could occur.

These significance criteria are used in a number of offshore development EIRs and are considered appropriate because commercial and recreational fishing businesses operate on slim profit margins. Relatively small reductions in fishing combined with closures of harbors and marinas could have large economic repercussions.

4.4.4 Impacts Analysis and Mitigation Measures

4.4.4.1 Long Wharf Routine Operations

Impact Assumptions

To determine the impacts associated with continued normal operations, the following assumptions were made:

- The analysis considers vessel movement and operations for the Long Wharf only;

- Vessels approach the Long Wharf from Southampton Shoal/Richmond Harbor RNA, traversing through CDFG block 488;

- The length of the vessel route from the Golden Gate Bridge to the Long Wharf is about 11.5 nm. A one-way trip through the Bay to the Long Wharf takes a tanker about 2 hours and a barge 3 hours; vessel unloading/loading operations range from 16 to 36 hours, depending on the vessel. Roundtrip vessel transit times from the 900 vessels servicing the Long Wharf average about 125 days per year or about 52 percent of the time available during a year;

- Vessel sizes range from 700 feet (barges) to 1,200 feet (tankers) in length and are about 200 feet wide;

- Fishing operators normally navigate a safe distance from an obstacle to avoid collision and entanglements. A 0.25-mile buffer around transiting vessels and a 0.5-mile buffer around the Long Wharfare used for all fisheries; and

- Preclusion impacts are based on comparing the size of the buffers at the Long Wharf and around transiting vessels to the areal extent of mapped fishing areas in CDFG block 488.

Impact FSH-1: Space Use Conflicts Between Long Wharf and Pacific Herring Fishing Operations

Space use conflicts between Long Wharf routine operations and commercial herring fishing could occur resulting in interference or displacement of herring fishing activities. Impacts would range from significant (Class II) to adverse, but less than significant (Class III), depending on herring spawning locations, fishing operations and other factors.

All Long Wharf operations occur in CDFG block 488 (Figure 4.4-1). According to CDFG statistics, 80 percent of commercial landings in block 488 (years 1991 – 2000) were Pacific herring. Other landings included northern anchovy, halibut, white croaker, rockfish, yellowfin goby, salmon, Dungeness crab, and numerous other species.

The Long Wharf operates 24 hours a day, 365 days a year. The causeway portion of the Chevron pier is 4,200 feet long and the T head is 3,440 feet long. Currently, and on average, tankers and barges make 75 calls per month or 2.5 per day. The Long Wharf is operating at maximum capacity and future activity is expected to remain about the same.

Although Section 4.3, Biological Resources, concludes that routine vessel traffic at the Long Wharf is expected to have adverse, but less than significant effects on fishes and benthic habitats, routine operations could interfere with future herring fishing operations.. The shoreline within 0.5 mile of the Long Wharf is spawning habitat (spawning occurred in the area in 2004 and 2005), and therefore, potential fishing area

as well. The total amount of habitat area, including along the Long Wharf, is about 3.88 square miles. This spawning and I fishing area is 6.9 percent of the 55.83 square miles of existing herring fishing area in the Bay and 1.4 percent of the 268.36 square miles of spawning habitat. Over the proposed lease period, the impacts on Pacific herring fisheries would likely range from Class II to Class III for several reasons: (1) the uncertainty over the extent of herring spawning in the Long Wharf area; (2) the uncertainty over the amount of total fishing area; and (3) the ability to mitigate space use conflicts. If Berth No. 4 is enlarged to accommodate double-hulled tankers, impacts would be similar to those discussed above.

FSH-1: Mitigation Measures for FSH-1:

FSH-1. Chevron shall participate in the Pacific herring commercial fishery annual public scoping and hearing process, part of CDFG's annual review of herring commercial fishing regulations. Because CDFG has the authority to modify or develop regulations to address space use conflicts between the fishery and Chevron's operations, Chevron shall abide by any future regulations CDFG may develop to reduce space use impacts.

Rationale for Mitigation: Participation in the CDFG review of herring regulations will help keep Chevron officials up-to-date on space use conflict regulations and reduce or avoid potential conflicts between the Long Wharf and Pacific herring fishing operations. If the annual review does not adequately address space use conflicts and they occur or are expected to occur during a fishing season, CDFG has the authority to quickly act by adopting emergency regulations to protect fish and wildlife resources, public peace, health and safety, or general welfare (Fish and Game Code Section 240).

Space use conflicts with the Pacific herring commercial fishery would be reduced to less than significant.

Impact FSH-2: Space Use Conflicts Between Bay Herring Fishery and Transiting Vessels

Space use conflicts between transiting vessels serving the Long Wharf and commercial herring operators could occur, resulting in interference or displacement of herring fishing activities. A significant impact could result (Class II).

Herring fishing and shipping activities, in particular, would likely continue to result in space use conflicts because vessels serving the Long Wharf would pass through active fishing areas, thus interfering with or displacing herring fishing activities. CDFG works with concerned parties to minimize conflicts; however, some fishing areas may be inaccessible. Herring fishing currently occurs predominantly within CDFG blocks 488 (Central Bay) and 489 (South Bay). In block 488, the fishing area currently totals nearly 18 linear miles. Fishing in South Bay takes up more than double the amount of

area, about 40 linear miles. In all, herring fishing areas occupy about 56 linear miles compared to spawning habitat that occupies about 268 linear miles. In any year, fishing could occur anywhere in the habitat areas.

In block 488, shipping corridors used by vessels calling at the Long Wharf pass through current herring fishing areas around Angel Island, off Alcatraz, and along portions of the Tiburon shore. In block 489, lightering operations at Anchorage 9 could continue to interfere with herring fishing operations. At any one time, a vessel would likely pass through about 10 percent of the fishing area for over half the time that fishing is occurring, and could result in significant impacts (Class II). In the future, impacts on herring fishing activities may vary because the fish change their spawning locations.

Mitigation Measures for FSH-2:

FSH-2. Chevron shall notify herring operators during the herring fishing season of vessel transits, through the CDFG Director's Herring Advisory Committee or other means. Chevron shall also participate MM FSH-1, the Pacific herring commercial fishery annual public scoping and hearing process, part of CDFG's annual review of herring commercial fishing regulations.

Rationale for Mitigation: The use of notification during the 3 to 4 month herring season would serve as a warning system notifying herring operators of the transiting vessels. This would serve as an aid to avoid interactions between transiting vessels and herring fishing activities. Participation in the CDFG review of herring regulations will help Chevron keep up-to-date on space use conflict regulations and reduce conflicts between Long Wharf and fishing operations. Space use conflicts from transiting vessels would be reduced to less than significant.

Impact FSH-3: Space Use Conflicts Between Bay Sport Fisheries and Normal Long Wharf Operations

Space use conflicts between sport fisheries in the Bay and normal Long Wharf operations are small and considered adverse, but less than significant (Class III).

The waters surrounding the Long Wharf support several sport and charter boat fisheries, including sturgeon, striped bass, halibut, shark, smelt, and perch. The 0.5-mile buffer excludes less than 5 percent of the sport boat fishing area in CDFG Block 488 and no shoreline fishing occurs within 0.5 mile of the Long Wharf. Impacts to fisheries near the Long Wharf are expected to be adverse, but less than significant (Class III) because the areas precluded to anglers are less than the 5 percent threshold identified in the significance criteria. If Berth No. 4 is enlarged to accommodate double-hulled tankers, impacts would be similar to those identified above for normal operations.

FSH-3: No mitigation is required.

Impact FSH-4: Space Use Conflicts Between Bay Sport Fisheries and Vessels Transiting To and From the Long Wharf

Space use conflicts between Bay sport fisheries and vessels transiting to and from the Long Wharf are expected to be infrequent, and if they occur, are expected to be limited to a small portion of available fishing. Impacts are considered to be adverse, but less than significant (Class III).

Recreational anglers fish for numerous species from charter and private boats and the nearby shoreline, including starry flounder, cabezon, shark, salmon, rockfish, sturgeon, halibut, and striped bass. As vessels continue to traverse the shipping channels, sport anglers would continue to temporarily lose a small portion (about 11.5 square miles, including the 0.25-mile buffer) of their fishing area. When the time factor for vessels transiting the area is calculated, this exclusion would constitute less than 1.5 percent of the area available to fishing and is considered adverse, but less than significant (Class III).

FSH-4: No mitigation is required.

Impact FSH-5: Space Use Conflicts Along the Outer Coast

Vessel operators handling crude oil and product may affect commercial or recreational fishing; space use conflicts are expected to be adverse, but less than significant (Class III).

Vessel operators handling Alaskan North Slope crude have voluntarily agreed to maintain a minimum distance of 50 nautical miles offshore the mainland. Other product tankers typically follow routes at an average distance of about 15 to 20 miles from the coastline. Most fishing vessels operate within 50 miles of the California coast, so space use conflicts have been anticipated by the USCG. The USCG's navigation rules, together with modern navigation equipment and communication gear aboard vessels and tankers will continue to be used by operators to avoid conflicts and allow mariners to co-exist.

FSH-5: No mitigation is required.

Impact FSH-6: Impacts on Fish and Habitat from Discharge of Ballast Water

Fisheries depend on a healthy environment to survive and flourish. Invasive species discharged from ballast water could impair water quality (Impacts WQ-2 and WQ-5) and biological resources (Impact BIO-4). These impacts to fisheries resources would impair commercial and sport fishing activities in the Bay and along the outer coast, resulting in significant adverse (Class I) impacts.

Impacts on fish and habitat will likely continue from discharges of ballast water. Section 4.2, Water Quality, (Impacts WQ-2 and WQ-5) concludes that segregated or non-segregated ballast water from tankers at the Long Wharf may contain harmful viruses, toxic algae or other harmful microorganisms. Biological Resources, Impact BIO-4 states that these invasive species impair estuarine habitat, benthic resources, destabilize food webs by out-competing Dungeness crabs, striped bass and other species, poison fish due to high concentrations of toxins, and cause fish kills. Recently expressed concern for the alarming declines of striped bass, longfin smelt and other pelagic organisms in the Bay-Delta implicates invasive species as a possible cause of those declines. The recently published Delta Smelt Action Plan states that ship ballast water is considered one of the major ways that foreign species are transported and spread throughout the Estuary (State of California 2005). Introduction of non-native invasive species, such as the Asian clam and cyclopoid copepod, may compete with native zooplankton and fishes, and may reduce available food for estuarine species. Asian clams also tend to concentrate pollutants such as selenium and organotins in its tissues. Fishes that feed on the Asian clam may have the potential to ingest quantities of toxins. The copepod may not only be a poor food source, it may be a predator of native copepods that are good food sources for other estuarine species in the food chain.

Fish depend on healthy habitats to survive and reproduce, and productive commercial and recreational fisheries are inextricably linked to healthy habitats (NMFS 2005). Invasive species' adverse effects on fish and habitat have the potential to impair sport and commercial fisheries in the Bay and on the outer coast and likely cause significant adverse impacts (Class I).

Mitigation Measures for FSH-6:

FSH-6a. Chevron shall: (1) carry out MM WQ-2 and MM WQ-5 for ballast water reporting, and for distributing advisories about the California Marine Invasive Species Control Act and proper disposal of non-segregated ballast water.

FSH-6b. Chevron shall participate and assist in funding ongoing and future actions related to invasive species and identified in the October 2005 Delta Smelt Action Plan (State of California 2005). The funding support shall be provided to the Pelagic Organism Decline Account or other account identified by the California Department of Water Resources and Department of Fish and Game, lead Action Plan agencies. The level of funding shall be determined through a cooperative effort between CSLC, and the Departments of Water Resources and Fish and Game and shall be based on criteria that establishes Chevron's commensurate share of the Plan's invasive species actions costs.

Rationale for Mitigation: See MM WQ-2 and MM WQ-5. Measure MM FSH-6a provides an interim tracking mechanism, advisories to tanker operators and prohibits disposal of non-segregated ballast until a feasible system to kill organisms in ballast water is developed. MM FSH-6b allows Chevron to contribute to a solution to problems caused by invasive species. Chevron's participation in the Delta Smelt Action Plan will keep company officials up-to-date on the causes of pelagic fish declines and the results of related invasive species studies and actions. Chevron's financial contributions will go directly to actions that are seeking solutions to the problem of pelagic species declines attributed to introduction of invasive species.

The criteria for determining the amount of Chevron's contributions may include (1) Chevron's percentage share of the marine terminals in San Francisco Bay that are serviced by vessels entering/exiting the Golden Gate (6.25 percent of 16 terminals {see Figure Location of Major Bay Area Terminals – Figure 4.2-1), or (2) Chevron's percentage share of vessels that enter through the Golden Gate and make calls at San Francisco Bay Area ports (3.99 percent [900 Long Wharf vessels] of 22,551 total vessels [excluding tows and tugs] in 2003}, and (3) the percentage share (as calculated in (1) or (2), for example} of the cost of the Plan actions related to invasive species. The Action Plan estimates that the cost of invasive species actions range from $41.7+ million to $75.7+ million. The actual total cost is unknown as the costs of some actions have not been identified and the costs of other actions will be refined as studies are completed. Chevron's share of the costs may be reviewed and revised as new information more clearly defines the role of invasive species in the pelagic organism declines.

The cooperative effort between CSLC and the Departments of Water Resources and Fish and Game would acknowledge and take advantage of the responsibilities of the Action Plan lead agencies and the responsibility and expertise of CSLC in administering the Marine Invasive Species Act of 2003.

Residual Impacts: Introduction of invasive species to San Francisco Bay by vessels servicing the Long Wharf will remain a significant adverse impact on commercial and sports fisheries (Class I).

Impact FSH-7: Contamination Due to Long Wharf Stormwater Run-off and Vessel Hull Anti-Fouling Paints

Chevron routine operations contribute to contamination of waters near the Long Wharf and to the Bay but impacts on sport and commercial fisheries are expected to be adverse, but less than significant (Class III).

Chevron routine operations contribute to contamination of waters near the Long Wharf and to the Bay. Impacts WQ-7 and WQ-9 conclude that this contamination from vessel hull anti-fouling paints and stormwater runoff are significant (Class I and II, respectively); however, the contamination is low when compared to other pollutant sources in the Bay. Impact BIO-5 concludes that effects on benthic habitat and fishes is adverse, but less than significant (Class III). Because the Long Wharf area is not

considered a "hot spot" (and unlikely to be an area that fishing interests would avoid) and impacts on habitat and fish are expected to be low, effects on sport and commercial fisheries are expected to be adverse, but less than significant (Class III).

FSH-7: No mitigation required.

Impact FSH-8: Continuing Maintenance and Anticipated New Dredging Near the Long Wharf

Continuation of maintenance dredging at the Long Wharf is expected to cause Class III impacts on sport fishing activities and Class II impacts on herring spawning and fishing, Dungeness crab and salmon resources. New dredging to accommodate larger, double-hulled tankers is expected to cause impacts similar to those caused by routine operations at the Long Wharf (Class II and Class III).

Within the Long Wharf buffer, maintenance dredging will continue on a routine basis to ensure that adequate water depth is maintained for tankers and barges. Little disturbance to sport fishing activities is anticipated because, generally, no fishing occurs within the buffer (Class III).

Dredging during herring spawning and commercial fishing seasons (generally December, January, February and into March) may disrupt herring spawning and cause space use conflicts with fishing activities. Herring spawning has occurred recently in the vicinity of the Long Wharf and the wharf, shoreline and nearby eel grass beds will likely continue to be good spawning habitat. The area also supports Dungeness crab habitat and migrating salmon. Impact BIO-3 concludes that routine and new dredging (if Berth No. 4 is expanded) is expected to have significant impacts (Class II) on herring, Dungeness crab and salmon resources. Dredging can also cause space use conflicts during herring fishing season.

Mitigation Measures for FSH-8:

FSH-8. Chevron shall comply with MM BIO-3 which calls for scheduling dredging during times of the year to avoid juvenile Dungeness crab, spring run Chinook salmon and herring spawning activity. In the event that dredging must occur in May and June (times to avoid for crab and salmon resources), MM BIO-3 requires consultation with CDFG and notification to CSLC.

Rationale for Mitigation: For FSH-8, the dredging "windows" laid out in MM BIO-3 are designed toavoid the most critical times in the Pacific herring, Dungeness crab and Chinook salmon life cycles, and thus, limit significant impacts on those fish, shellfish and related fisheries. Avoiding dredging during most of the Pacific herring spawning season will limit space use conflicts with the commercial herring fishing fleet. MM FSH-8b requires that Chevron alert herring operators to anticipated dredging activities during

the entire Pacific herring spawning and fishing season and to participate in CDFG's annual review of herring regulations to reduce or avoid space use conflicts. Impacts would be reduced to less than significant.

4.4.4.2 Oil Spills in the Estuary or Along Outer Coast

Impact FSH-9: Fisheries Impacts from Accidental Spills at the Long Wharf or along Bay Transit Routes

Shrimp, herring and sport fisheries in central and north San Francisco Bay, San Pablo Bay, Carquinez Strait and elsewhere in the estuary are at highest risk of spill contamination. Depending on spill location, size and water and weather conditions, areas upstream of the confluence of the Sacramento and San Joaquin rivers may also suffer harm. In addition marinas, launch ramps and fishing access points in the Bays may be threatened, contaminated or closed. Significant adverse impacts (Class I and II) to Bay commercial and sport fisheries would result from oil spill accidents originating at the Long Wharf or from tankers transiting the coast that service the wharf.

A significant impact to fisheries would likely result from an accidental spill of crude oil or crude oil product in either San Francisco Bay or within outer coast waters now and in the future. The severity of the impact would depend on the size and location of the spill, the composition of the oil, the characteristics of the spill (instantaneous vs. prolonged discharge; surface vs. subsurface spill), environmental conditions, the effect of weathering on spill properties, and the effectiveness of cleanup operations.

Fisheries would be affected by oil spills both quantitatively and qualitatively in many different ways. Depending on the affected fisheries and the extent of impacts, the impacts can be minor and localized or large and extend across whole regions. The length of time needed to clean up a spill is a factor, and based on data from actual spills, is variable and difficult to predict. For these reasons, the quantitative impact assessment presents the minimum level of impacts that are expected. Qualitative factors would most likely increase the level of impacts. For more detail on how fisheries are affected by spills, refer to the EIR for Consideration of a New Lease for the Operation of a Crude Oil and Petroleum Product Marine Terminal at Unocal's San Francisco Refinery at Oleum (Chambers Group 1994) (Section 4.5.3.2, Accident Conditions).

Accident Conditions Within the Bay

This assessment of impacts from modeled oil spills compares the oil spill trajectories illustrated in Section 4.0, Existing Environment and Impacts Analysis, to fishing patterns illustrated on Figures 4.4-1, 4.4-2, and 4.4-3 through use of a GIS. Commercial herring, recreational sturgeon, and salmon fisheries are seasonal; however, the modeled spills are not specific to any season. Therefore, for purposes of this analysis, it was assumed

that the spills occurred during the fishing seasons. Rough estimates of the amount of commercial landings that could be lost are also calculated. For these calculations, catches are assumed to be evenly distributed throughout the mapped fishing areas.

The percentage of affected fishing area is compared to the 10 percent impact threshold. The impact analysis on piers and marinas is provided in Land Use and Recreation, Section 4.5.4, Impacts Analysis and Mitigation Monitoring, and is summarized here as part of the qualitative analysis. Preclusion, i.e., short-term, impacts are expected to last no more than one fishing season. Resource (biological) impacts as presented in Water Quality, Section 4.3.4, Impacts Analysis and Mitigation Monitoring, are generally determined to be Class I and may last for more than one season. Dungeness crab habitat and eelgrass beds near the Long Wharf are expected to be at high to very high risk of being contaminated by spills in the Bay. Open water fishes and habitat would experience Class II impacts. Economic effects from impacts on Bay fisheries may also be long term, depending on public reaction, public education on the spill's effects, seafood markets, and other factors.

Impact Assessments

Oil spill scenarios are described below and used as an indicator to evaluate potential impacts. Each scenario was modeled as a 1,000-bbl spill launched at the Long Wharf as described in Section 4.0, Existing Environment and Impacts Analysis, and detailed in Appendix B. The five spill scenarios demonstrate that given the size of the modeled spills and different wind and tidal conditions, released oil would generally travel within the area between the Carquinez Straits and Oakland and remain east of the Golden Gate Bridge. The spills would not travel much into the South Bay, and therefore generally avoid resources south of the San Francisco-Oakland Bay Bridge. For this reason, the small steelhead fishery in Alameda Creek and the shrimp fishery at the extreme south end would not be affected by the modeled spills. Actual spills associated with Long Wharf activities of different sizes and launched from different locations have the potential to cause impacts on other Bay fisheries, as illustrated in the Unocal EIR (Chambers Group Inc. 1994) (Section 4.5.3.2, Accident Conditions).

Table 4.4-3 summarizes the following quantified impact assessment from modeled spills Nos. 33, 68, 73, 91 and 93. Refer to Appendix C Table 4 for a quantified impact assessment on each fishery. Mitigation measures focus on timely oil spill response and cleanup, compensation for financial and environmental damages, and evaluation of the effectiveness of response measures.

Table 4.4-3
Summary of Significant (Class I) Quantified Impacts From Representative Oil Spill Scenarios

Fishery	Central Bay Impacts	San Pablo Bay Impacts
Shrimp	None	Nos. 68, 73, 91
Herring Fishing	Nos. 68, 73	No. 73
Herring Spawning	Nos. 33, 68, 73	Nos. 68, 73, 93
Recreational	Nos. 33, 68, 73, 91	Nos. 68, 73, 91, 93

Berkeley/Emeryville No. 33

The modeled spill travels as far south as the Oakland-San Francisco Bay Bridge, remains east of the Tiburon Peninsula, and travels north nearly to the mouth of the Carquinez Straits. The oil would contact herring fishing areas along the Bay Bridge and around Treasure and Angel Islands; however, only about 2 square miles (about 4 percent of the fishing area) would be affected by the spill and result in an adverse, but less than significant impact (Class III). Conversely, about 47 square miles (18 percent) of herring spawning habitat would be affected, causing a significant, adverse impact (Class I). Only 0.05 square mile (less than 1 percent) of the shrimp fishing area in San Pablo Bay would be affected (Class III). By far, most of the impact would occur in CDFG block 488 (Central Bay and vicinity of Long Wharf). If the spill had occurred during the 1996 herring fishing season, about 49,320 pounds (4 percent of the 12.3 million in total landings for the season) would have been lost due to preclusion impacts.

The oil modeled in the scenario would cover about 170 square miles of 1,320 square miles of recreational fishing area, a significant impact (Class I). Impacts on individual fisheries would range from Class I to Class III and would occur south of the Bay Bridge, in Central Bay (Block 488), and San Pablo Bay. Most impacts would occur in Central and San Pablo Bays.

Fishing activities would be further affected by closures of 4 piers and 19 marinas, contamination of fish and their habitat, and loss or damage to fishing gear that comes in contact with the spilled oil. Pier and marina closures and loss or damage to fisheries and fishing gear would increase the impacts on fishing operations and angling activities. These impacts would range from Class I to Class III (depending on time needed to clean up the spill, effects on fish populations and habitat, and long and short term economic effects, including lost harvesting time) and would be in addition to the quantified impacts described above.

West Central Bay No. 68

The modeled spill covers the majority of the Bay from about 5 miles south of the Long Wharf to about 10 miles north of the Long Wharf. The spill would likely travel up the creeks and sloughs in north and south Marin County, including Corte Madera and

San Rafael Creeks. Herring fishing and spawning areas in CDFG blocks 488 and 301 would be affected by the spill. The spill would cover 3.6 square miles of fishing and 16 square miles of spawning habitat, a significant, adverse (Class I) impact in block 488 and an adverse, but less than significant (Class III) impact in block 301 and for the Bay as a whole. The spill would cover about 5.9 square miles of the shrimp fishing area in block 301, a significant, adverse (Class I) impact in that block and in the Bay as a whole. If the spill had occurred during the 1996 herring season, 73,980 pounds of herring roe would have been lost (based on preclusion of 6 percent of total herring fishing area in the Bay). If the spill occurred during the 1995 shrimp fishing season, 60 percent or 151,816 pounds of shrimp would have been lost.

The modeled spill would also affect about 231 square miles of the 1,320 square mile area used by anglers, a significant, adverse (Class I) impact. Impacts on individual fisheries would range from Class I to Class III and would occur in Central and San Pablo Bays. Most impacts would occur in San Pablo Bay, except that most impacts on the shoreline fisheries would occur in Central Bay.

Fishing activities would be further affected by closures of 5 piers and 10 marinas and impacts on fishing gear and on fish and their habitat that comes in contact with the spilled oil. These impacts would range from Class I to Class III, and be in addition to the quantified impacts described above (see Berkeley/Emeryville section for more detail).

Brooks Island/Richmond No. 73

The modeled spill covers much of Central Bay, but avoids San Francisco and Sausalito, and affects most of the southern portion of San Pablo Bay as shown in Figure 4.4-5. The spill would likely travel up creeks along the Berkeley and Richmond Shores, including Wild Cat and San Pablo Creeks. Herring spawning and fishing areas in CDFG blocks 301 and 488 would be covered by the spill; the spill would inundate over 8.5 square miles of fishing areas and nearly 60 square miles of spawning habitat, a significant, adverse (Class I) impact. Nearly half of the shrimp fishery in block 301 (4 square miles) would be covered, a significant, adverse (Class I) impact in the block and the Bay as a whole. If the spill had occurred during the 1996 herring season, 184,950 pounds of herring roe would have been lost (based on preclusion of 15 percent of total herring fishing area in the Bay). If the spill occurred during the 1995 shrimp fishing season, 10 percent or 101,210 pounds of shrimp would have been lost.

The spill would cover about 286 square miles of the 1,320 square miles of recreational fishing areas, a significant, adverse (Class I) impact. Most fisheries would suffer significant, adverse (Class I) impacts; shallow water fishing areas would experience an adverse but less than significant (Class III) impact. Significant, adverse impacts would occur in Central and San Pablo Bays; shoreline fisheries would suffer significant, adverse impacts only in Central Bay.

Figure 4.4-5 – Brooks Island/Richmond Oil Spread Scenario – Impacts on Fisheries)

Fishing activities would be further affected by closures of 7 piers and 27 marinas, and impacts on fishing gear and on fish and their habitat that comes in contact with the spilled oil. These impacts would range from Class I to Class III, and be in addition to the quantified impacts described above (see Berkeley/Emeryville section for more detail).

West San Pablo Bay No. 91

This modeled spill hugs the Richmond and north Marin County shores, as well as the western portion of San Pablo Bay as shown in Figure 4.4-6. The oil would likely travel up rivers and creeks such as the Petaluma River, and the Novato and San Rafael Creeks. The spill would affect about 13 square miles of herring spawning habitat along the Richmond shoreline in CDFG block 488, an adverse, but less than significant impact (Class III). However, the impact on the shrimp fishery in block 301 would be significant, because the oil would contact half the fishing area (5.3 square miles). If the spill had occurred during the 1996 herring season, 283,590 pounds of herring roe would have been lost (based on preclusion of 23 percent of total herring fishing area in the Bay). If the spill occurred during the 1995 shrimp fishing season, 14 percent or 141,695 pounds of shrimp would have been lost.

The spill would also affect about 192 square miles of the 1,320 square mile angling area, a significant, adverse (Class I) impact. Impacts on individual fisheries would range from Class I to Class III. The oil would affect fisheries in Central and San Pablo Bays only, a significant, adverse (Class I) impact; shoreline fisheries would suffer significant, adverse (Class I) impacts in block San Pablo Bay (see Berkeley/Emeryville section for more detail).

Fishing activities would be further affected by closures of 3 piers and 10 marinas, impacts on fishing gear, and impacts on fish and their habitat that comes in contact with the spilled oil. These impacts would range from Class I to Class III, and be in addition to the quantified impacts described above.

Southeast San Pablo Bay No. 93

This modeled spill hugs the northeastern shore from the Long Wharf into San Pablo Bay, up to the Carquinez Strait. The oil would likely travel up creeks such as Wild Cat and Refugio. About 10 square miles of spawning habitat would be covered with oil; a significant, adverse (Class I) impact in CDFG block 301 and an adverse, but less than significant (Class III) impact in block 488. Although block 301 would suffer Class I impacts, most of the affected (6.9 square miles) and unaffected (155.56 square miles) spawning area is located in block 488. If the spill had occurred during the 1996 herring season, 221,940 pounds of herring roe would have been lost (based on preclusion of 14 percent of total herring fishing area in the Bay).

Figure 4.4-6 –

The spill would affect 155 square miles of the 1,320 square mile recreational fishing area, a significant, adverse (Class I) impact. Impacts on individual fisheries range from Class I to Class III. Significant, adverse (Class I) impacts would occur in San Pablo Bay and adverse, but less than significant (Class III) impacts would occur in blocks San Pablo and Suisun Bays.

Fishing activities would be further affected by closures of 3 piers and 7 marinas, and impacts on fishing gear and on fish and their habitat that comes in contact with the spilled oil. These impacts would range from Class I to Class III, and be in addition to the quantified impacts described above (see Berkeley/Emeryville section for more detail).

Mitigation Measures for FSH-9:

The following mitigation measures shall be carried out by Chevron to minimize the areas precluded to fishing during a spill and subsequent cleanup, and to help offset the losses to fishing interests and businesses dependent on fishing activities.

FSH-9a. Implement MM OS-3, MM OS-4, MM OS-6 and MM OS-7 in Operational Safety/ Risk of Accidents, and MM BIO-6b and BIO-6d in Biological Resources, to lower the probability of any oil spill and increase response capability.

FSH-9b. Post notices at spill sites and marinas, launch ramps and fishing access points to warn fishing interests of locations of contaminated sites. Notices shall be written in English, Vietnamese, Cantonese and Spanish, and be posted in areas most likely to be seen by fishing interests.

FSH-9c. If damages to fishing operations or related businesses occur, as a last resort, provide financial compensation. Any losses shall be documented as soon as possible after a spill using methods for determining damages established beforehand. Response for damage losses should include provisions for compensating operators and businesses as soon as possible.

FSH-9d. Following a spill, evaluate the effectiveness of oil spill mitigation measures used to respond to a spill caused at the Long Wharf or by tankers calling at the Wharf. Results of the evaluation would be available to public decision-makers to ensure refinement, and if necessary, modification of mitigation measures. Evaluation would be done only after an accident and would include monitoring using scientifically accepted protocols. Costs for the evaluation would be borne by Chevron for spills caused at the Long Wharf or by Chevron-owned tankers. Chevron shall contribute to independent public or

private organizations for oil spill research. Contributions would be determined in cooperation with the evaluating organizations, agencies, and the CSLC.

Rationale for Mitigation: For MM FSH-9a, the MM OS-3 measures would lower the probability of an oil spill by allowing for quick release of mooring lines (OS-3a), monitoring of tension of the mooring lines (OS-3b), allision avoidance (OS-3c), and developing a comprehensive preventative maintenance program. OS-4 requires that Chevron improve their response capability as new techniques and equipment become available. These measures help to reduce spills and their associated impacts. However, the impacts associated with the consequences of spills could remain significant. OS-6 includes provisions for dealing with tank vessel fires and explosions for tankers berthed at the Long Wharf. OS-7a requires Chevron to participate in any analysis that will examine upgrades to the Bay VTS. In the event that a tanker calling at the Long Wharf causes a spill and is not owned by Chevron, OS-7b acknowledges that Chevron is more suited to provide immediate response to a spill using its own equipment and resources, rather than waiting for mobilization and arrival of the vessel's response organization.

MM BIO-6b and MM BIO-6d will help to ensure rapid response to sensitive eel grass beds and other sport and commercial fish habitat areas.

Containment of spills and protection of resources may reduce impacts to fisheries, but significant impacts will likely remain. Posting notices in multiple languages (MM FSH-9b) provides information to English and non-English speaking anglers to protect the public from contact with contaminated fish. Providing compensation (MM FSH-9c) helps to pay for the costs of cleanup and fishing business losses, and evaluations of the effectiveness of mitigation measures (MM FSH-9d) and contribution to oil spill research would help to refine such measures to increase effectiveness for future spill events.

Over the short term (less than a year) some fishing interests may not be compensated, and opportunities would be lost while fishing areas are inaccessible. These impacts may be especially acute for anglers who depend on fishing for a major source of food. Over the long term, impacts could result if, for example, areas remain closed due to contamination, or public fears of eating contaminated fish result.

Residual Impacts: Impacts could remain significant (Class I).

Impact FSH-10: Fisheries Impacts from Accidental Spills Along Outer Coast Transit Routes

Significant adverse impacts (Class I and II) to outer coast commercial and sport fisheries could result from oil spill accidents from the expected 900 transiting tankers calling at the Long Wharf. The level of impact would depend on the size of the spill, location, and fisheries occurring in the area of the spill.

Analysis for this section is taken from The Unocal EIR (Chambers Group, Inc. 1994) and the Getty Gaviota Marine Terminal EIR (Aspen Environmental Group 1992) and is incorporated by reference. To summarize, Chambers Group, Inc. (1994) assessed impacts from two crude oil spill scenarios, 100,000 bbls each, one launched in March off the Farallone Islands and the other launched in October, southwest of Punta Gorda. Impacts ranged from adverse and significant to adverse, but less than significant (Class I to Class III), depending on the location of the spills, location of the fisheries, and the number of harbors or shoreline access points affected. Impacts were assessed on commercial and recreational fisheries, aquaculture operations, and kelp harvesting activities in the area from Del Norte County to Monterey County.

Scenario 1 (Farallone Islands) caused significant adverse impacts (Class I) on commercial and recreational fisheries from Point Reyes to Monterey County and on aquaculture operations in Monterey Bay and off Santa Cruz. Significant adverse impacts that could be mitigated to less than significant (Class II) occurred to kelp harvesting from Point Montara to Monterey Bay. If vessels calling at the Long Wharf cause similar spills, impacts on aquaculture operations would be more severe. In 1994, 4 operations would have been affected; now, 10 operations in Marin, San Mateo, Santa Cruz, and Monterey Counties would be affected by a similar spill.

Scenario 2 (Punta Gorda) caused Class I and Class III impacts on commercial and recreational fisheries, no impacts on aquaculture operations, and Class II impacts on kelp harvesting. A similar spill from a tanker calling at the Long Wharf would likely cause similar impacts.

Aspen Environmental Group (1992) assessed coast wide impacts from two spill scenarios that launched spills from the Santa Barbara Channel and Santa Monica Bay; both were 100,000-bbl spills.

The Santa Barbara Channel spill caused significant adverse impacts (Class I) on commercial and recreational fisheries in the Channel and less than significant impacts on fisheries located off Morro Bay and Los Angeles.

The spill caused Class I impacts on aquaculture operations, Class II short-term impacts, and Class III long-term impacts on kelp harvesting. Impacts from a spill caused by a vessel calling at the Long Wharf are expected to be similar.

The Santa Monica Bay spill caused significant adverse impacts (Class I) on commercial fisheries off Los Angeles and on recreational fisheries off Santa Barbara, Ventura, and Los Angeles Counties. The spill caused Class II impacts on aquaculture operations off Los Angeles, Ventura, and Orange Counties. Kelp harvesting operations were significantly affected (Class II) over the short term. Over the long term, kelp plants would likely recover and harvesting would resume, resulting in adverse, but less than significant impacts (Class III). A similar spill caused by a tanker servicing the Long Wharf would affect fewer aquaculture operations, because currently there is only one operation left off Los Angeles County and none off Orange County. However, the two

operations in Ventura and the one in Los Angeles County would still be affected by the spill, resulting in Class II impacts. Chevron is only responsible for Chevron-owned vessels. Containment/response actions are discussed in Impact OS-7, Operational Safety/Risk of Upset.

Mitigation Measures for FSH-10:

FSH-10. Chevron shall implement MM OS-7 for VTS upgrade participation and to provide immediate spill response near/at the terminal. For spills from Chevron owned vessels Chevron officials shall implement FSH-9b through MM FSH-9d to notify fishing interests of possible contamination of fishing areas, to help offset the losses to fishing interests and businesses dependent on fishing activities, and to evaluate effectiveness of mitigation measures.

Rationale for Mitigation: Significant impacts are likely to occur even with containment. OS-7 requires Chevron to participate in any analysis that will examine upgrades to the Bay VTS, and to provide immediate response to a spill using its own equipment and resources, rather than waiting for mobilization and arrival of the vessel's response organization. FSH-9 requires the posting of notices provides information to protect the public from contact with contaminated fish, providing compensation helps to pay for the costs of cleanup and fishing business losses, and evaluating the effectiveness of mitigation measures and contributing to oil spill research helps to refine such measures to increase effectiveness for future spill events.

Residual Impacts: Residual impacts are expected to remain significant (Class I).

4.4.5 Impacts of Alternatives

Impact FSH-11: No Project Alternative

The alternative would eliminate the fisheries impacts associated with operations at the Long Wharf resulting in a beneficial (Class IV) impact. Fisheries impacts from shipping activities would be transferred to other marine terminals and would be similar to the proposed Project. Chevron has no responsibility for these terminals.

Under the No Project Alternative, Chevron's lease would not be renewed and the existing Long Wharf would be subsequently decommissioned with its components abandoned in place, removed, or a combination thereof. The decommissioning of the Long Wharf would follow an Abandonment and Restoration Plan as described in Section 3.3.1, No Project Alternative.

Under the No Project Alternative, alternative means of crude oil / product transportation would need to be in place prior to decommissioning of the Long Wharf, or the operation of the Chevron Refinery would cease production, at least temporarily. It is more likely, however, that under the No Project Alternative, Chevron would pursue alternative means of traditional crude oil transportation, such as a pipeline transportation, or use of

a different marine terminal. Accordingly, this EIR describes and analyzes the potential environmental impacts of these alternatives. For the purposes of this EIR, it has been assumed that the No Project Alternative would result in a decommissioning schedule that would consider implementation of one of the described transportation alternatives. Any future crude oil or product transportation alternative would be the subject of a subsequent application to the CSLC and other agencies having jurisdiction, depending on the proposed alternative.

Decommissioning and/or deconstruction of the Long Wharf would cause temporary disturbance to eelgrass beds, fisheries habitat and nearby sport fishing (Class II). In the long-term, fisheries habitat would likely be reclaimed and more area would likely open up for sport fishing, resulting in a beneficial impact (Class IV).

FSH-11: No mitigation is required.

Impact FSH-12: Full Throughput Via Pipeline Alternative

Transferring shipping to other terminals while continuing throughput through the Refinery may require construction/operation/maintenance of new pipelines. Impacts would range from Class I to III, depending on location of the pipelines.

This alternative proposes increased use of existing pipelines and possibly construction/ operation of new pipelines to transport product stored and refined at the Chevron facility. It is assumed use of these pipelines would redirect tankers to other terminals in the area, including Shell Refining Martinez, Valero Benicia and Tesoro Amorco. Impacts on commercial and sport fisheries would be eliminated at the Long Wharf, but vessel related impacts would be transferred to the three terminals and would be similar to impacts for the proposed Project.

Pipeline construction/operation/maintenance, could impact water crossings, and could cause erosion and siltation that may flow down rivers, creeks and sloughs and adversely impact Bay fisheries and habitat. Oil spills from pipelines can contaminate the Bay estuary, outer coast, groundwater or flow down rivers, creeks and sloughs, harming fisheries and habitat. Impacts from pipeline construction, operation, maintenance and accidental spills would range from Class I to Class III, depending on locations of the pipelines and the number of stream crossings.

Mitigation Measures for FSH – 12:

FSH-12. Mitigation measures to address pipeline construction/operation impacts on Bay fisheries including construction surveys to minimize hazards/impacts, establishing buffer zones, conducting worker training for construction/maintenance in sensitive areas, confining activities to pipeline right-of-ways, planning for and minimizing disturbance at water crossings, measures to eliminate or minimize water and soil contamination, erosion control measures, pipeline burial and protection,

floodplain protection, and adequate oil spill response and planning shall be carried out. In addition implement MM OS9, MM BIO-6b and MM BIO-6d and MM FSH-9b.

Rationale for mitigation: Pipeline construction/operation/maintenance, depending on location of new pipelines, would likely cause erosion and siltation that would adversely impact Bay fisheries. Oil spills from pipelines and transiting oil vessels are also likely and can contaminate the Bay estuary, outer coast, groundwater or flow down rivers, creeks and sloughs, harming fisheries and habitat. Complying with MM OS-9, MM BIO-6b and 6d and MM FSH-9b through 9d would ensure that mitigation applied to the proposed Project would also apply to other terminals, and when appropriate, to the pipeline operator. These measures would lower the probability of spills and increase response capabilities.

Residual impacts: Residual impacts depend on the location of pipelines and severity of oil spills.

Impact FSH-13: Conceptual Consolidation Terminal Alternative

Chevrons' use of the Long Wharf would decrease by 50 percent. The remaining vessel operations, along with associated impacts would be transferred to a new consolidated terminal. Impacts from routine operations and oil spills associated with the Long Wharf would be the same as described for the proposed Project, Class I to Class III. Impacts on fisheries from construction, routine use and oil spills associated with the new terminal and pipeline would range from Class I to Class III.

With this alternative, Chevron operations, including vessel traffic, would be reduced by 50 percent of current operations and the consolidated terminal would accommodate the remaining 50 percent. Long Wharf operations could conflict with the herring fishery if fishing returns to the area, resulting in impacts that would range from Class I to III. Chevron vessels would traverse through CDFG block 488 and affect 9 percent of the commercial herring fishery in the block, for about 16 percent of the herring season, constituting a significant (Class II) impact. Lightering operations in block 489 would likely contribute to these impacts. Oil spill effects would be the same as described above for the proposed Project, (ranging from Class I to III) except that the risk of spills occurring at the Long Wharf and from Chevron tankers would be less. Impacts at and from the consolidated terminal would likely be similar to those at the Long Wharf due to its location and expected capacity.

Depending on its location, the new facility would close off existing sport fishing areas and adversely impact fish habitat. Effects on Pacific herring spawning and fishing operations would range from Class I to Class III. Construction/operation/maintenance of a new pipeline would also likely impact fisheries (Class I to Class III).

Mitigation Measures for FSH-13

FSH-13a. Mitigation, as described for the proposed Project (MM FSH-1 through MM FSH-10), would be required at the Long Wharf and the other terminal.

FSH-13b. Carry out MM FSH-12 for pipeline construction, operation, and maintenance.

Rationale for Mitigation: Impacts from operation of the Long Wharf would be caused by 450 vessels serving the Long Wharf, rather than the 900 projected for the proposed Project. The same types of impacts would occur as projected for the proposed Project. Depending on its location, similar impacts would be expected at a new consolidated terminal, in addition to impacts from a new pipeline that would connect the two facilities. Pipeline construction/operation/maintenance, depending on location of new pipelines, would likely cause erosion and siltation that would adversely impact Bay fisheries. Oil spills are also likely and can contaminate the Bay, outer coast, groundwater or flow down rivers, creeks and sloughs, harming fisheries and habitat.

Residual impacts: Residual impacts are dependant on on the location of the new terminal and pipelines.

4.4.6 Cumulative Projects Impacts Analysis

This cumulative impact analysis considers effects from past, present, and identified future oil and non-oil related development on marine resource harvesting activities. The analysis takes into consideration cumulative terminal operations and vessel traffic for both the Bay and the outer coast. The analysis is based on the project summaries presented in Section 3.4.2.,Description of Cumulative Projects..

Impact CUM FSH-1: Space Use Conflicts with Bay Fisheries

The cumulative projects would cause space use conflicts with the Pacific herring, shrimp and sports fisheries and result in significant (Class I and II) impacts. Chevrons' contribution to space use conflicts with the Pacific herring fishery ranges from Class II to Class III, depending on herring spawning locations, fishing operations and other factors.

Routine Operations

Operations at the Long Wharf would continue in conjunction with port operations, navigation and bridge improvement projects, marina improvements, commercial and recreational development on old military properties and new ferry service; some projects would be located near the Long Wharf. Cumulative impacts from harbor and shipping activities throughout the Bay, including impacts from Long Wharf related operations, would range from Class I to Class III, as explained below.

Space use conflicts between the Pacific herring fishery and commercial and industrial activities in Bay harbors and at shipping terminals would continue and vary depending on the location and size of the fishing area and the level of disturbance from future development. For example, the new ferry service and improvements to the San Francisco Bay Bridge may disturb or preclude herring spawning, and thus impact the fishery. Chevron's contribution would range from Class II to III due to the changing nature of the fishery (see Section 4.4.4, Impacts Analysis and Mitigation Measures).

Sport fishing activities would continue throughout the Bay and the new developments may further preclude these activities. Depending on the mitigation measures, significant impacts would either be reduced to less than significant or would remain. Chevron's contribution to the impacts would be Class III.

Space use conflicts from shipping activities would continue. Marine vessels transiting to and from the Ports of San Francisco, Oakland and Richmond and other harbors would continue to use the established shipping channels. These channels would continue to preclude access to fishing areas, but also serve to concentrate traffic so that other areas would continue to be available for fishing. Chevron's contribution to these activities is small, but adverse, ranging from Class III on sport fisheries and Class II to III on the herring fishery. Chevron's vessels, excluding associated towing and tug vessels, constitute about 900 vessels calls a year or about 20 percent of total tanker and barge calls in the Bay. When compared to total vessel traffic in the Bay (57,567 vessel calls per year), Chevron's tankers and barges contribute to about 1.6 percent of the vessel traffic; when associated tow and tug vessels are considered (3,586 calls at Richmond Harbor per year) the percentage increases to 7 percent.

Mitigation Measures for CUM-FSH-1:

CUM-FSH-1. Chevron shall implement MM FSH-1 and MM FSH-2 to mitigate for impacts from operation of the Long Wharf and related transiting vessels.

Rationale for mitigation: These measures require Chevron to participate in the CDFG annual review of herring regulations and to notify herring operators of vessel transits during the herring season. The measures will keep Chevron up-to-date on space use conflict regulations enforced by CDFG and would serve as a warning system notifying herring operators of transiting vessels. Chevron has no responsibility for other vessels transiting through the estuary.

Residual Impacts: Space use conflicts between the herring fleet and normal harbor and terminal operations may remain a significant adverse impact (Class I) due to seasonal changes to the fishery, locations of projects and residual impacts from those projects.

Impact CUM-FSH-2: Impacts on Fish and Habitat from Discharge of Ballast Water

About 22,551 vessel calls per year (excluding tows and tugs) from outside the Golden Gate have the potential to introduce invasive species to the San Francisco Bay estuary and cause irreparable harm to Bay habitat, related fisheries and the ecosystem, as a whole. Chevron's contribution to this problem is about 4 percent, based on the expected number of vessel calls to the Long Wharf compared with the 22,551 vessel calls in the Bay. The significant adverse impact is expected to be Class I.

Invasive species, brought to the San Francisco Bay Estuary by vessels entering the Golden Gate have been implicated as a possible cause of alarming declines in Delta smelt, longfin smelt and striped bass populations. Adverse impacts on fish or their habitat are expected to affect sport and commercial fisheries, since fisheries need a healthy environmental to survive and flourish.

About 22,551 vessel calls per year (using 2003 data in Table 2.5-1) have the potential to bring invasive species to San Francisco Bay in ballast water or on the vessel hulls. Although compliance with the Marine Invasive Species Program is impressive, exceeding 95 percent, new non-native species can still invade the estuary and cause irreparable damage to Bay fisheries. Chevron's contribution to the problem is about 4 percent, based on the number of vessel calls to the Long Wharf and Bay terminals, as a whole.

Mitigation Measure for Cum-FSH-2:

CUM-FSH-2. Chevron officials shall comply with MM FSH-6.

Rationale for Mitigation: Measure MM FSH-6a (MM WQ-2 and MM WQ-5) provides an interim tracking mechanism, advisories to tanker operators and prohibits disposal of non-segregated ballast until a feasible system to kill organisms in ballast water is developed. MM FSH-6b allows Chevron to contribute to a solution to problems caused by invasive species. Chevron's participation in the Delta Smelt Action Plan will keep company officials up-to-date on the causes of pelagic fish declines and the results of related invasive species studies and actions. Chevron's financial contributions will go directly to actions that are seeking solutions to the problem of pelagic species declines attributed to introduction of invasive species. See MM FSH-6b for full text of mitigation.

Residual Impacts: Introduction of invasive species to San Francisco Bay by vessels calling at Bay marine terminals and harbors will remain a significant adverse impact on commercial and sports fisheries (Class I).

Impact CUM-FSH-3: Contaminant and Dredging Impacts on Fisheries

Chevron's contribution to the San Francisco Bay Estuary of contaminants from stormwater runoff and anti-fouling paints is small when compared to discharges from other development. However, because contaminants (on a cumulative basis) have caused irreparable and adverse harm to the Bay, impacts to plankton and fish populations are significant per Impact CUM BIO-1. These cumulative impacts are likely significantly impacting sport and commercial fishing success (Class I). Cumulative impacts from dredging is expected to be significant, but mitigable (Class II).

Section 4.3.6, Cumulative Projects Impacts Analysis, concludes cumulative development in the Bay would pose: (1) Class I impacts on the benthos from shipping and channel dredging activities, (2) Class I impacts on fishes, in general, from discharge of contaminants in the Bay, (3) Class II impacts on Chinook salmon (endangered species), Dungeness crab and Pacific herring from dredging at the Wharf and elsewhere, and (4) Class III impacts on the benthos from discharge of contaminants. These impacts can adversely affect the viability of Bay commercial and sport fisheries. Chevron's continuing contribution to the these impacts is considered to be small because its discharges from the Long Wharf are vastly dwarfed by urban runoff and other industrial discharges, and about 1.6 percent of all vessel calls in San Francisco Bay service the Long Wharf. Cumulative impacts on fisheries from contaminants and dredging are expected to range from Class I to Class III.

Mitigation Measures for CUM-FSH-3:

CUM-FSH-3. Carry out MM CUM-WQ-1 and MM FSH-8.

Rationale for mitigation: Chevron's implementation of measures to decrease spill risk, increase response capability and prepare measures specific to the Long Wharf in its SWPPP would help the Long Wharf reduce its contribution of contaminants into the water, and thus help to reduce impacts to fisheries. The dredging "windows" laid out in MM FSH-8 are designed to avoid most critical times in the Pacific herring, Dungeness crab and Chinook salmon life cycles, and thus, limit significant impacts on those fish, shellfish and related fisheries. .

Residual Impacts: Significant, cumulative impacts on water quality and fisheries from contaminants will remain.

Impact CUM-FSH-4: Accident Conditions

Cumulative impacts on fisheries from oil spills from harbor and shipping activities throughout the Bay and transiting vessels along the outer coast, including impacts from the Long Wharf related vessels, would range from Class I to Class III. Chevron has no responsibility for vessels transiting the Bay or outer coast that are not associated with the Long Wharf.

Spills from the Long Wharf

The fisheries at greatest risk from 1,000-bbl spills at the Long Wharf are in the Central Bay (CDFG block 488) and San Pablo Bay (CDFG block 301). The individual fisheries which would be at highest risk, and therefore, incur significant (Class I) impacts, include herring fishing and spawning and a host of recreational fisheries, including bass, halibut, rockfish, salmon, shark, ray, sturgeon, perch, and smelt. Impacts on other Bay fisheries would likely be adverse, but less than significant (Class III).

Spills from Tankers

Cumulative tankering in the Bay has the potential to result in a greater geographical spread of oil. Generally, high risks would occur from the Carquinez Strait through eastern San Pablo Bay, into San Francisco Bay south to Alameda, and west to the Golden Gate. Fisheries in the central portion of the Bay (off San Francisco, Oakland, and Tiburon) are at an extremely high risk of contact with spilled oil (30 to 39 percent) and would result in significant, adverse (Class I) impacts.

Oil spill risk and resulting cumulative impacts of oil spills from Long Wharf operations and other vessel activities would likely result in significant, adverse (Class I) impacts at local terminals, in the Bay, and along the outer coast.

Mitigation Measures for CUM-FSH-4:

CUM-FSH-4. Implement proposed Project MM FSH-9.

Rationale for mitigation: The measures that comprise MM FSH-9 would: (1) minimize impacts on fish habitat and resources; (2) minimize the areas precluded to fishing during a spill and subsequent cleanup; and (3) help to offset the losses to fishing interests and businesses depending on fishing activities. Chevron would have no responsibility for vessels it does not own or those that would call at other terminals or facilities.

Residual Impacts: Cumulative impacts from oil spills would remain significant (Class I) in the estuary and along the coast.

Table 4.4-4 summarizes Commercial and Sport Fisheries impacts and mitigation measures.

Table 4.4-4
Summary of Commercial and Sport Fisheries Impacts and Mitigation Measures

Impacts		Mitigation Measures	
FSH-1:	Space Use Conflicts Between Long Wharf and Pacific Herring Fishing Operations	**FSH-1:**	Chevron shall participate in the Pacific Herring commercial fishery annual public scoping and hearing process and CDFG's annual review.
FSH-2:	Space Use Conflicts Between Bay Herring Fishery and Transiting Vessels	**FSH-2:**	Chevron officials shall notify herring operators during the fishing season of vessel transits and participate in MM FSH-1.
FSH-3:	Space Use Conflicts Between Bay Sport Fisheries and Normal Long Wharf Operations	No mitigation required.	
FSH-4:	Space Use Conflicts Between Bay Sport Fisheries and Vessels Transiting To and From the Long Wharf	No mitigation required.	
FSH-5:	Space Use Conflicts Along the Outer Coast	No mitigation required.	
FSH-6:	Impacts on Fish and Habitat from Discharge of Ballast Water	**FSH-6a:**	Long Wharf officials shall carry out MM WQ-2 and MM WQ-5.
		FSH-6b:	Chevron shall participate and assist in funding ongoing and future actions related to invasive species and identified in the October 2005 Delta Smelt Action Plan and shall contribute a share of the cost of carrying out the action plan.
FSH-7:	Fish Contamination Due to Wharf Stormwater Run-off and Vessel Hull Anti-Fouling Paints	No mitigation required.	
FSH-8:	Continuing Maintenance and Anticipated New Dredging Near the Long Wharf	**FSH-8:**	Comply with MM BIO-3, notify herring operators of anticipated dredging activities during the entire herring fishing season.
FSH-9:	Fisheries Impacts for Accidental Spills at the Long Wharf or along Bay Transit Routes	**FSH-9a:**	Implement MM OS-3, MM OS-4, MM OS-6, MM OS-7, MM BIO-6b and BIO-6d.
		FSH-9b:	Warnings shall be posted in different languages at spill sites and marinas, launch ramps and fishing access points.
		FSH-9c:	Provide financial compensation.
		FSH-9d:	Evaluate the effectiveness of mitigation measures and contribute to independent or private organizations for oil spill research.
FSH-10:	Fisheries Impacts from Accidental Spills Along Outer Coast Transit Routes	**FSH-10:**	Implement MM OS-7, and for spills from Chevron owned vessels carry out MM FSH-9b through FSH-9d.
FSH-11:	No Project Alternative	No mitigation required.	

Table 4.4-4 (continued)
Summary of Commercial and Sport Fisheries Impacts and Mitigation Measures

Impacts	Mitigation Measures
FSH-12: Full Throughput Via Pipeline Alternative	**FSH-12:** Carry out mitigation measures to address pipeline construction/operation and implement MM OS-9, MM BIO-6b and 6d and MM FSH-9b through 9d.
FSH-13: Conceptual Consolidation Terminal Alternative	**FSH-13a:** Implement MM FSH-1 through MM FSH-10. **FSH-13b:** Carry out MM FSH-12.
CUM-FSH-1: Space Use Conflicts with Bay Fisheries	**CUM-FSH-1:** Implement MM FSH-1 and MM FSH-2.
CUM-FSH-2: Impacts on Fish and Habitat from Discharge of Ballast Water	**CUM-FSH-2:** Comply with MM FSH-6.
CUM-FSH-3: Contaminant and Dredging Impacts on Fisheries	**CUM-FSH-3:** Implement MM CUM WQ-1 and MM FSH-8.
CUM-FSH-4: Accident Conditions	**CUM-FSH-4:** Implement MM FSH-9.